

US EPA ARCHIVE DOCUMENT

# Termite Mitigation in Schools

## A Holistic Approach



Image: Gerald Lenhard,  
LSU; Bugwood.org

Center of Expertise for School IPM













# Benefits of School IPM

- ▶ **Smart:** addresses the root cause of pest problems
- ▶ **Sensible:** provides a healthier learning environment
- ▶ **Sustainable:** better long-term control of pests



# Presenters



**Faith Oi, Ph.D.**



**Dan Lisenko**

# Termite Mitigation in Schools

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Faith M. Oi  
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If you can't take the time to do it  
right...

**You must make  
the time to do it  
over!**

What is a termite and should I be concerned since schools are mostly concrete and steel?





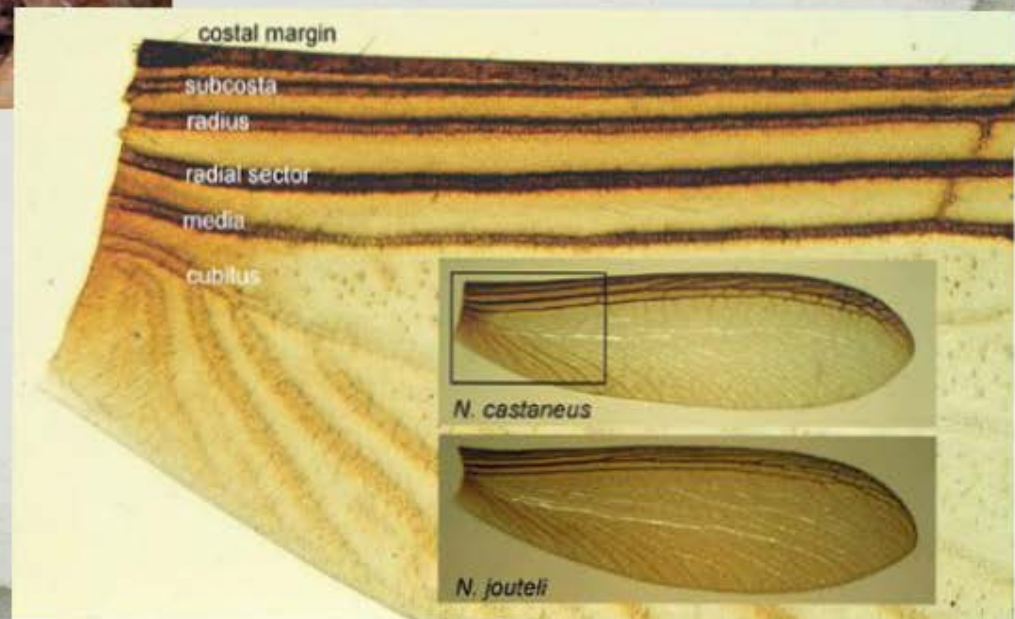
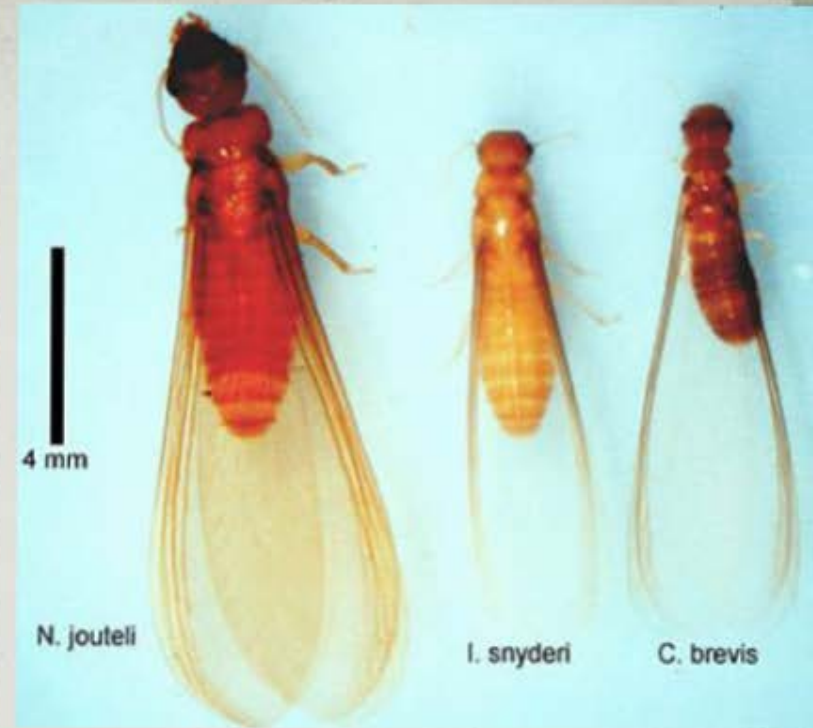
# What is a Termite?

- Soft-bodied, blind workers
- Squeeze into cracks  $<1/16$  inch (???)
- Live in colonies in cooperation with each other. Efficient.
- Complex chemical communication
- Structurally destructive
- Over 100 million years old



# Types of Termites

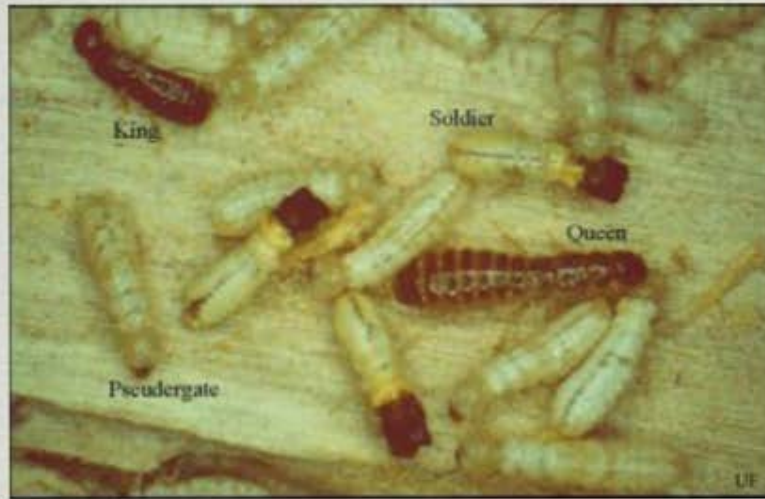
## Dampwoods





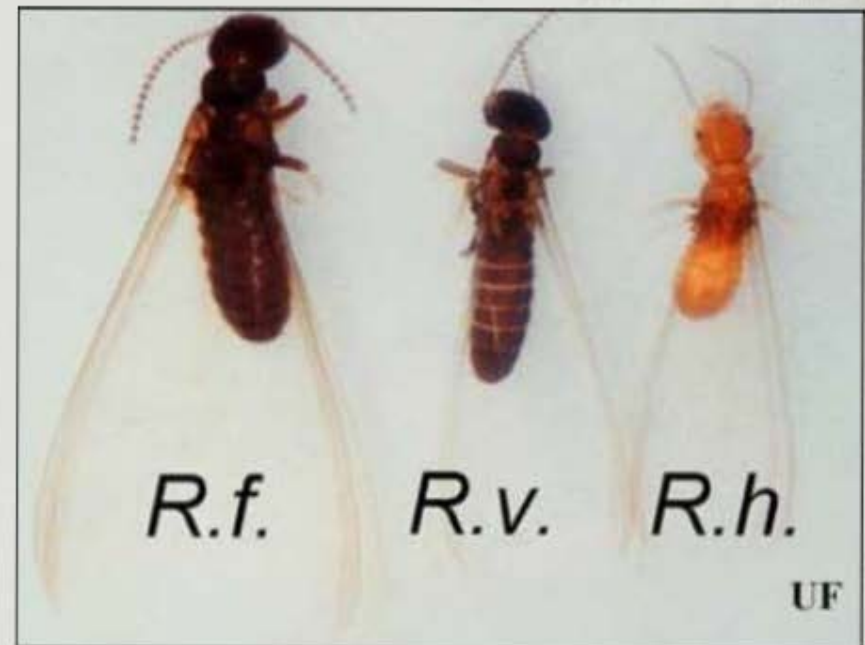
# Types of Termite

## Drywoods



# Types of Termites

## Subterranean





# Why are Termites so Hard to Kill?

- Eusocial
  - Cooperative brood care
  - Overlapping generations
  - Reproductive division of labor
- Castes
  - Worker
  - Soldier
  - Reproductives



# Subterranean Termite Biology

## Primary Reproductives

- Alates (swarmers)
  - Pair
    - Est. lifespan: up to 7-10 years
    - Queen: Unknown
  - Spring and fall
    - 60,000 (Su et al.)





# Subterranean Termite Biology

- Secondary reproductives
  - Replacement or supplement
  - 600+ in one log
  - Can not just kill the queen



# Subterranean Termite Biology

- Soldiers
  - Defenders
  - Low percentage of colony
  - Need to be fed
  - Highly sclerotized head
  - Smooth, prominent mandibles





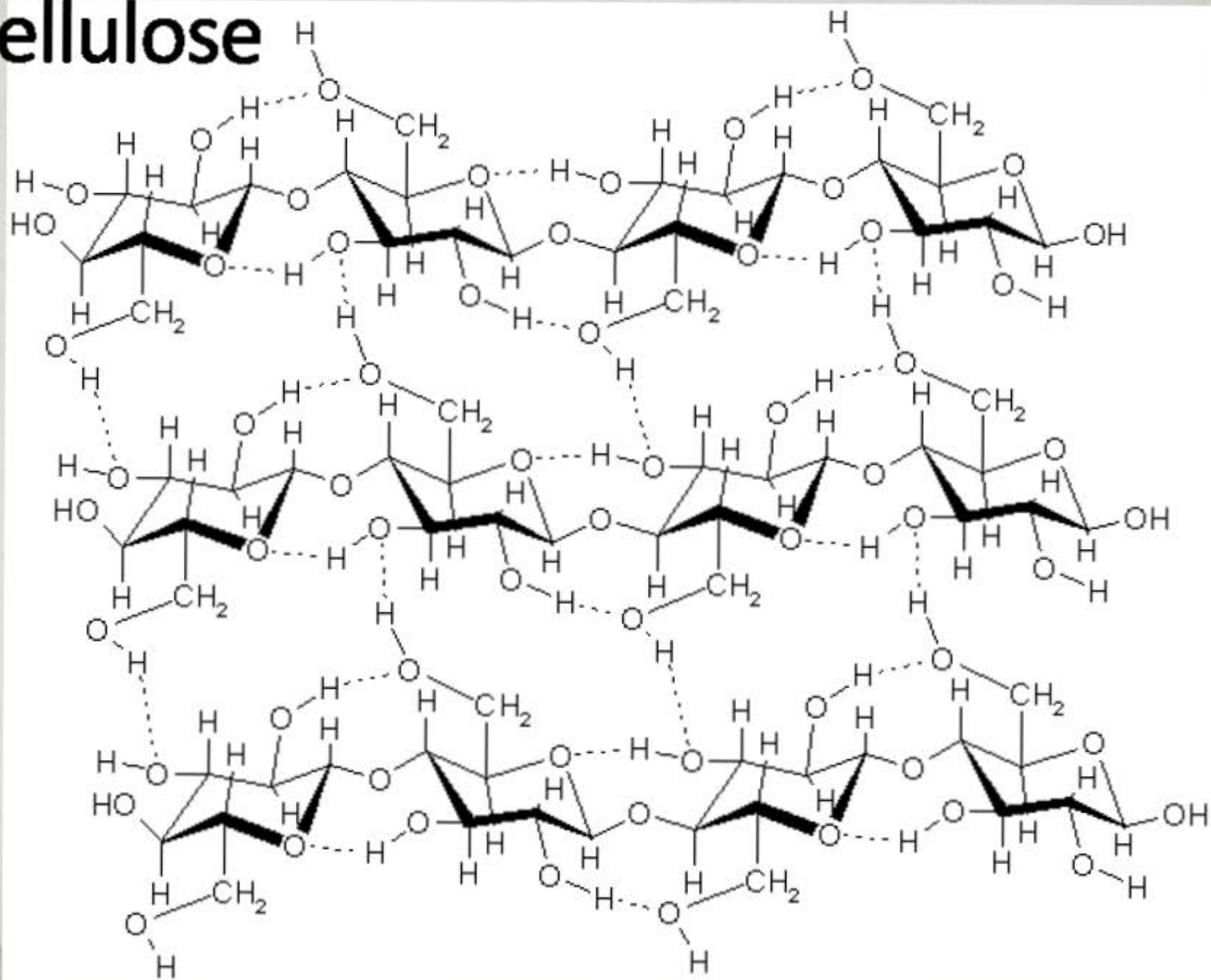
# Subterranean Termite Biology

- Workers
  - Damaging form
  - Forage for food
  - Tend royal pair, young, and soldiers
  - Build tunnels and tubes
  - Defend colony
  - Est. lifespan: few months to 2 years



Worker Termites

# Cellulose





# Why Subs Cause So Much Damage

- Social
  - Live together in a colony
- Colony size: Few thousand to over 10 million
- Territory: Around 200 sq. ft. to over an acre
- How do they find our structures?

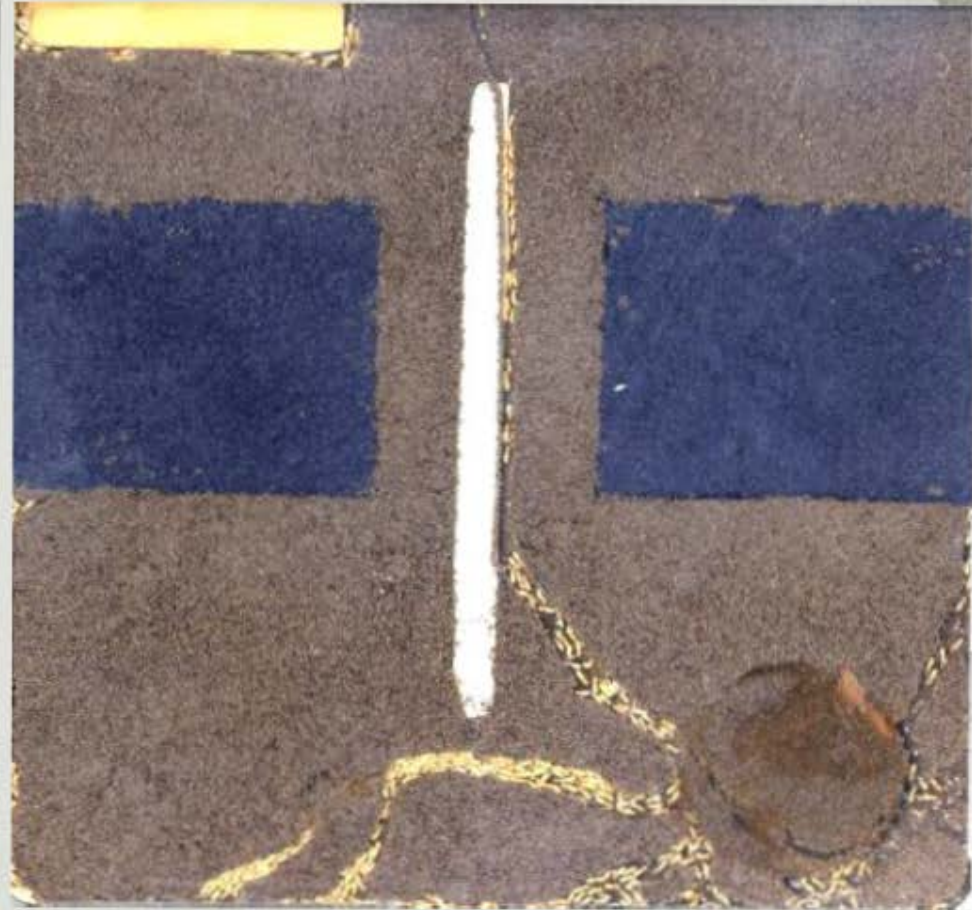


Jane Medley, University of Florida

# Foraging and Guidelines



**Day 14**



**Day 14 (Found Gap 3d)**





Disruptive

Costly





# Contents



**How do I know I have termites?**



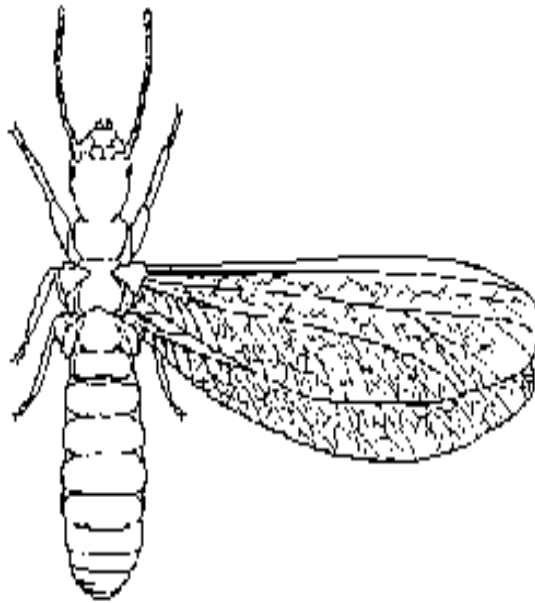
# Know the Difference...

- ...between termites and ants,  
drywoods and subs

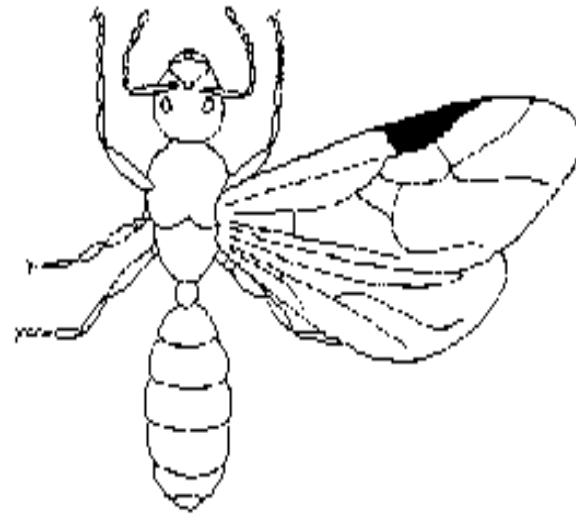
# Termite vs. Ant

## A Source of Common Confusion

- Termites
- Order Isoptera (maybe)
- No waist
- Forewing and hindwing about equal
- Moniliform (beaded) antennae
- Soft-bodied
  - Preserve in alcohol



**Termite**



**Ant**

- Ants
- Order Hymenoptera
- Waist
- Forewing larger than hindwing
- Geniculate (elbowed) antennae
- Hard exoskeleton





# Evidence of Infestation

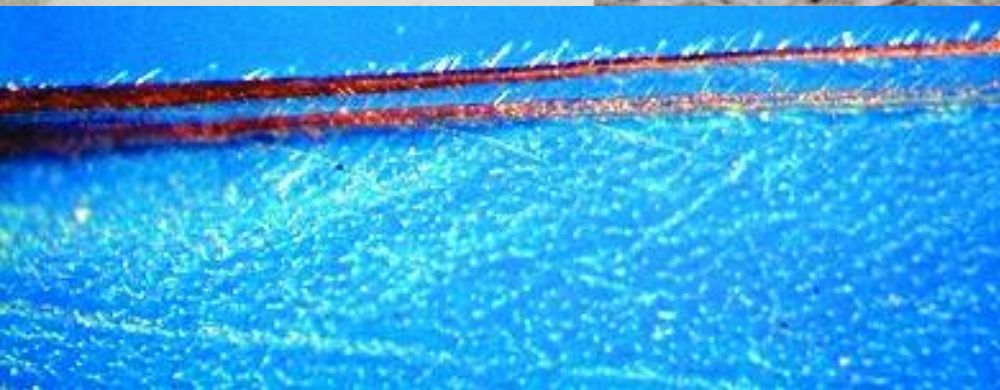
- Mud tubes
- Wings
- Frass/pellets





# Evidence of Infestation

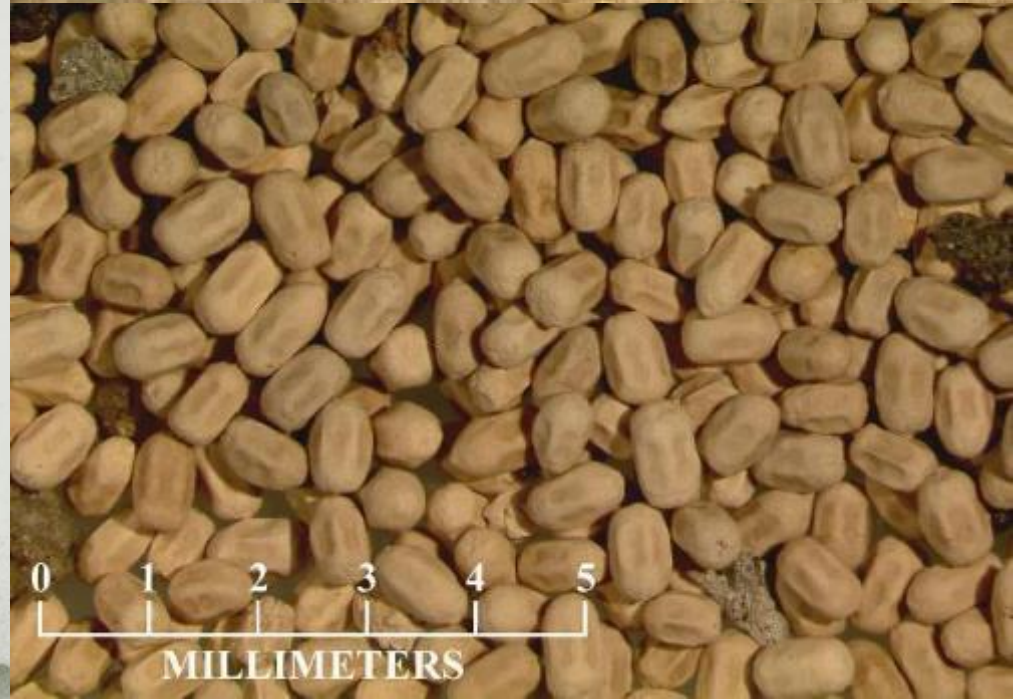
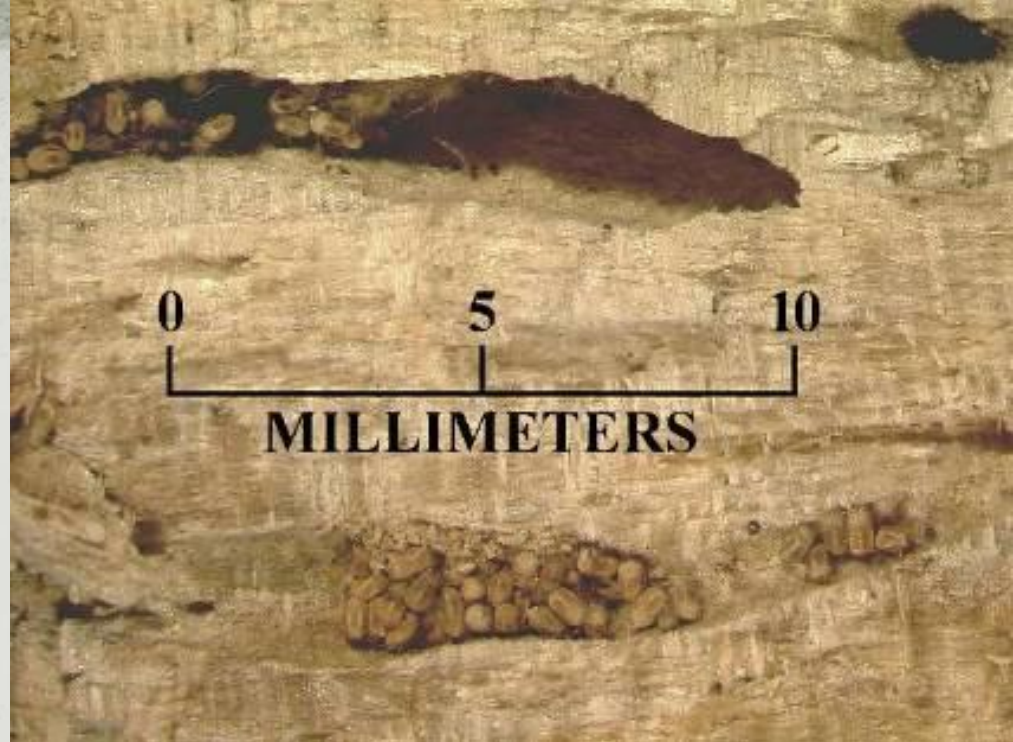
- Mud tubes
- Wings
- Frass/pelle





# Evidence of Infestation

- Mud tubes
- Wings
- Frass/pellets





# Evidence of Infestation

- Time of swarm
  - Month
  - Day, dusk, evening
- Sometimes lucky enough to get termite
  - In alcohol







What did this damage?





What did this damage?





Case Study



Case Study



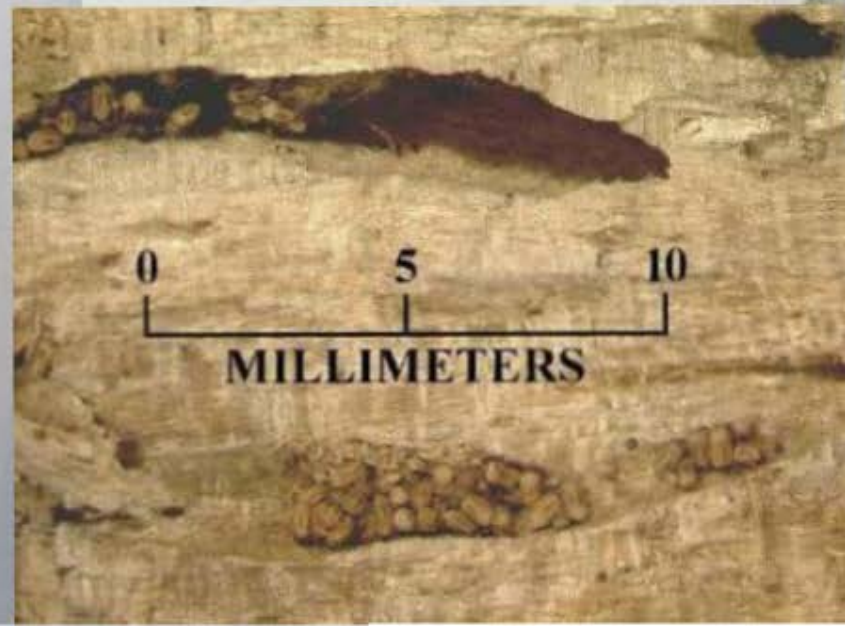


Case Study





# Match the Treatment





# What Can You Tell Me About This?

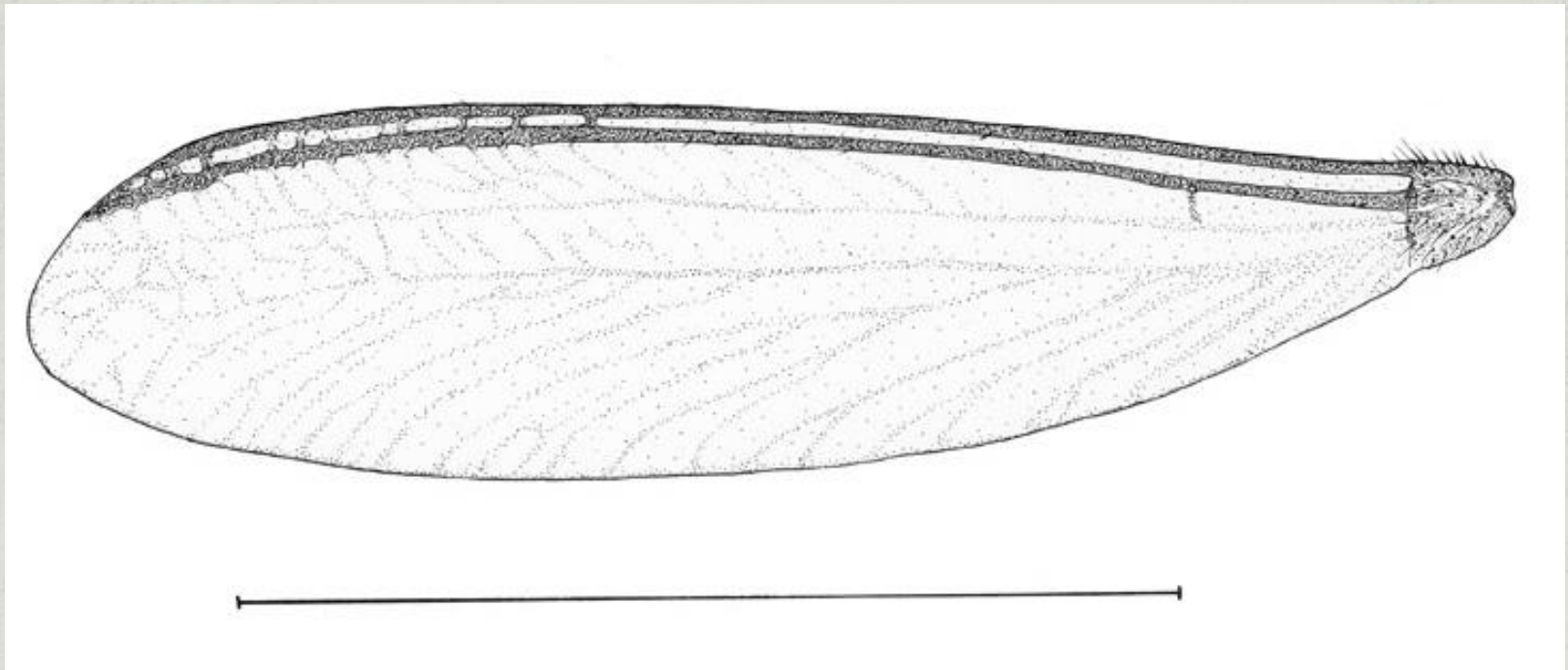






# If you can count to four...

2 “veins”



<http://mississippientomologicalmuseum.org.msstate.edu/museumpersonnel./Jones.published.drawings/Termite.drawings.htm#.VpwphfkrJhE>



# To whom do I belong?

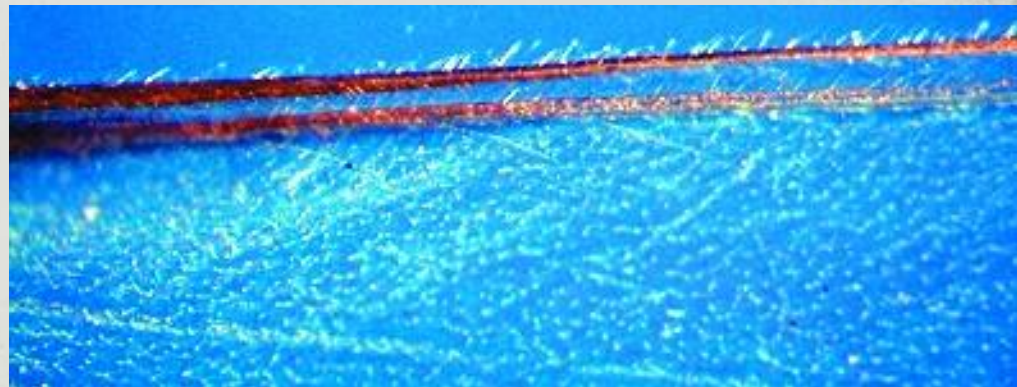


<http://insectsinthecity.blogspot.com/2013/10/whos-who-of-wdis.html>

# To whom do I belong?



## Family?



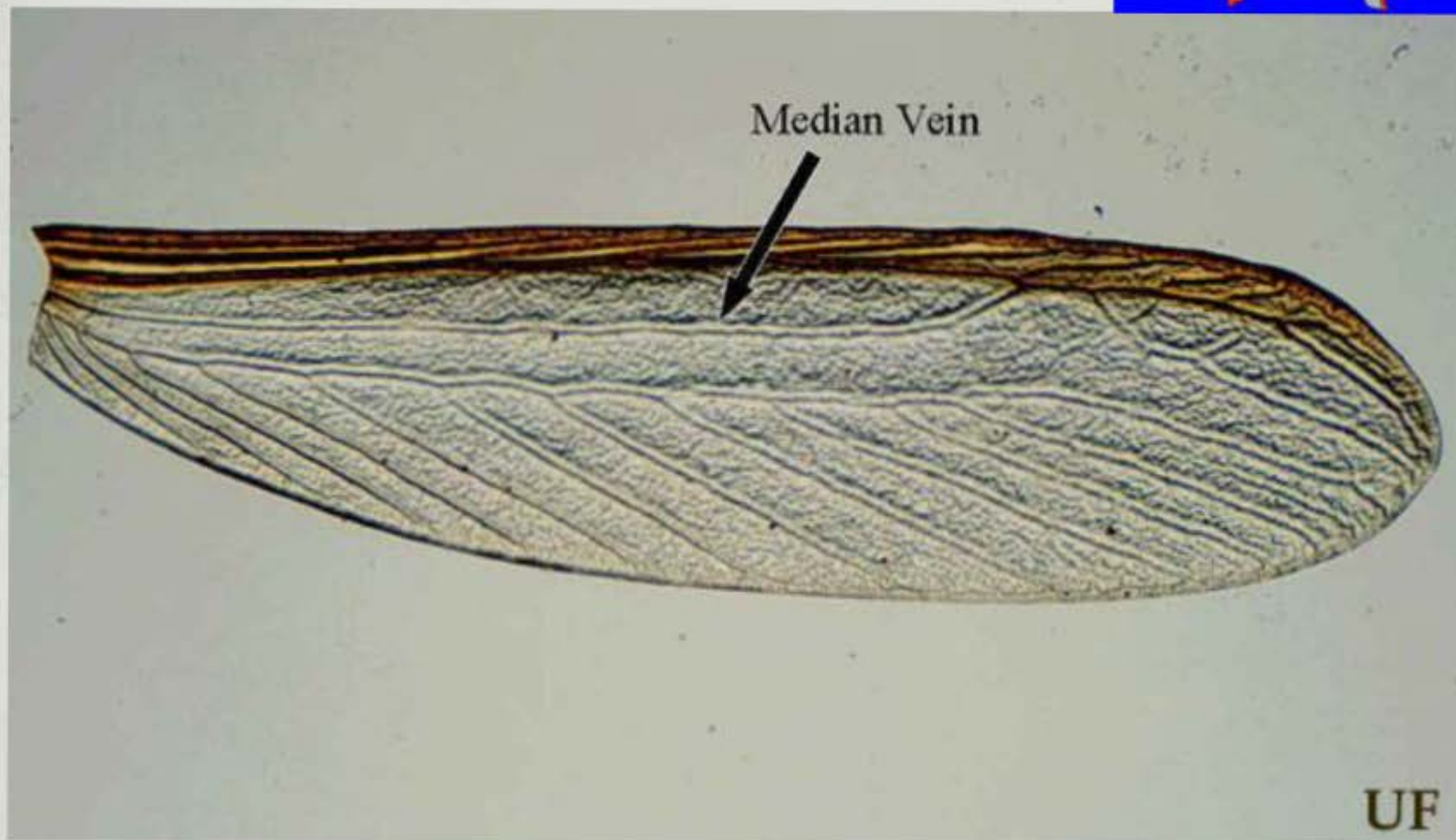
## Genus?





**Figure 10. *Reticulitermes* species alates from the southeastern USA. From left to right: *R. virginicus*, *R. nelsonae*, *R. hageni*, *R. malletei*, *R. flavipes*. Scale bar = 1.00 mm.**

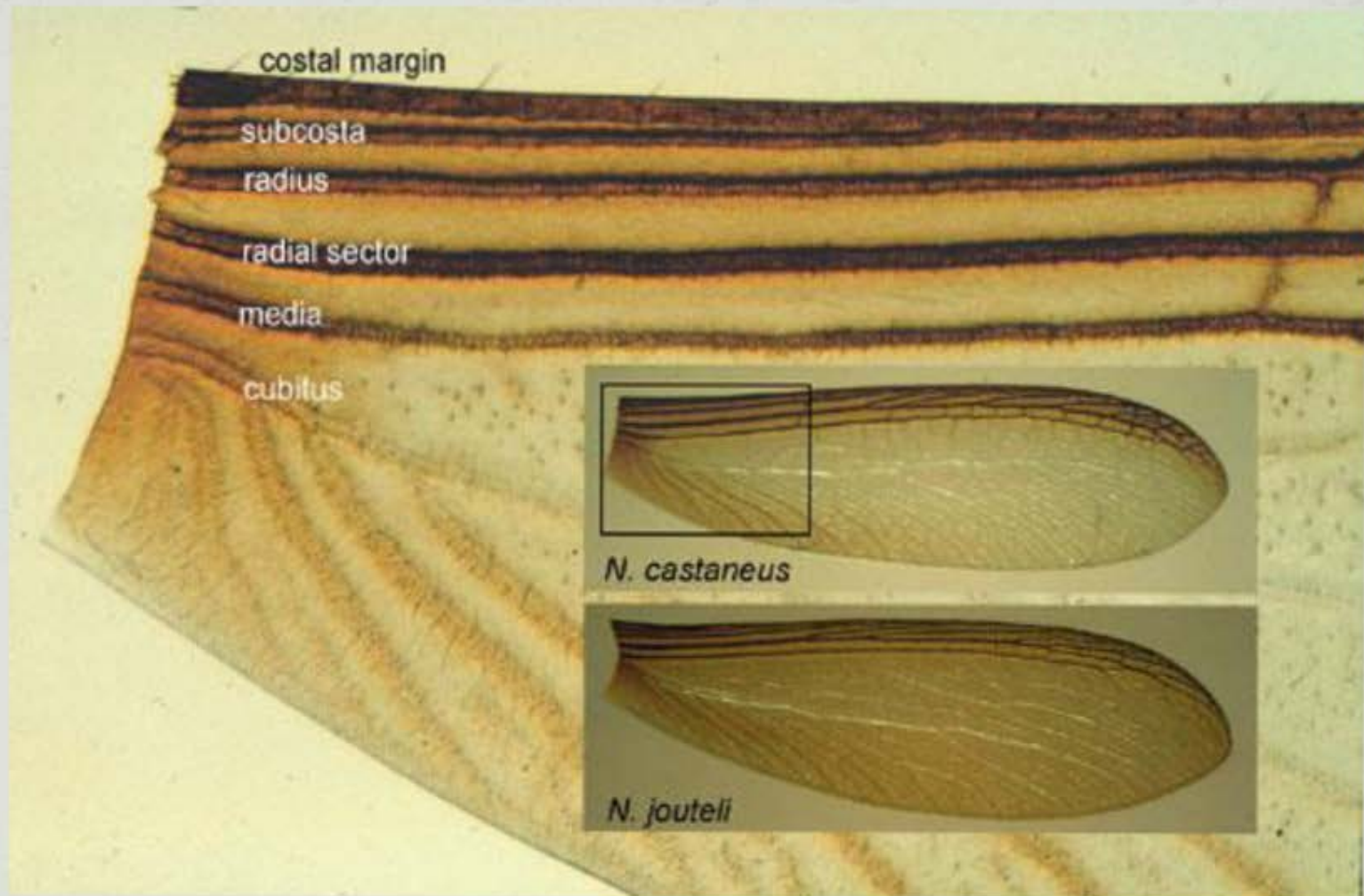
# *Cryptotermes brevis*



Stolen from R. Scheffrahn

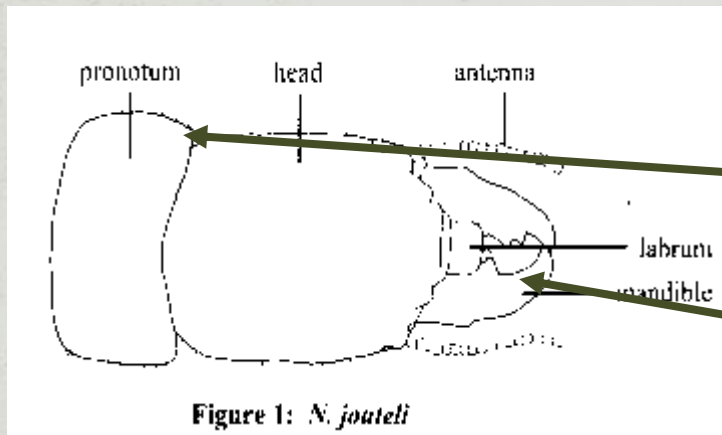


# *Neotermes* sp



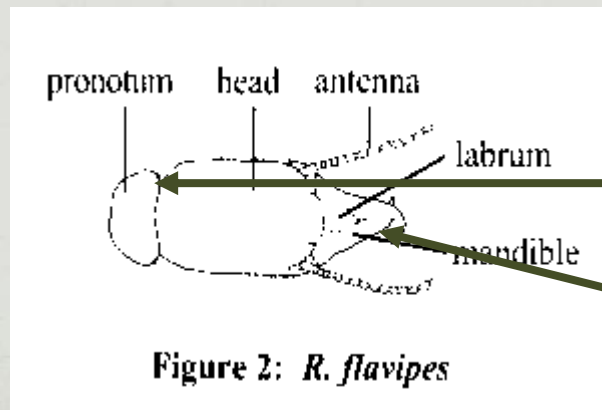
Stolen from R. Scheffrahn

# Subterranean vs Nonsubterranean termites



## Nonsubterranean

- pronotum as wide as or wider than head
- mandibles with teeth

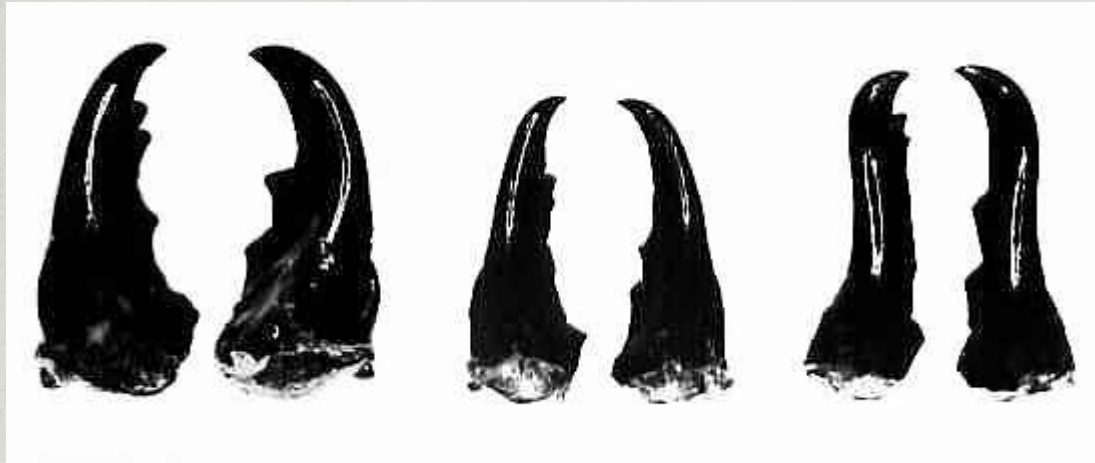


## Subterranean

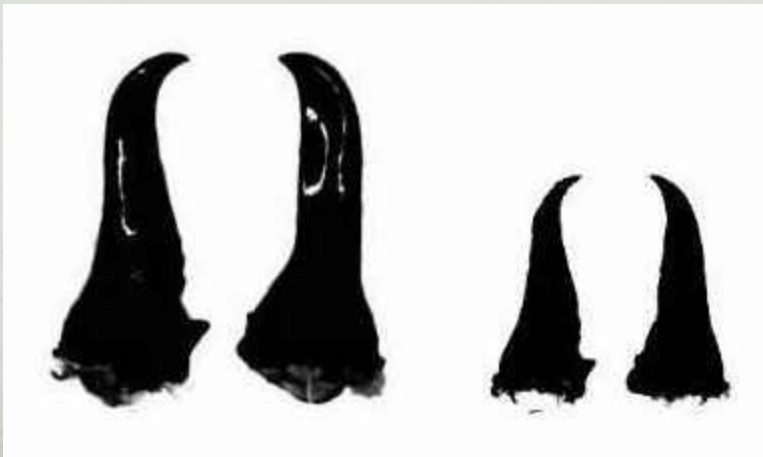
- pronotum narrower than head
- mandibles smooth in appearance teeth



# Drywood vs Subterranean soldiers



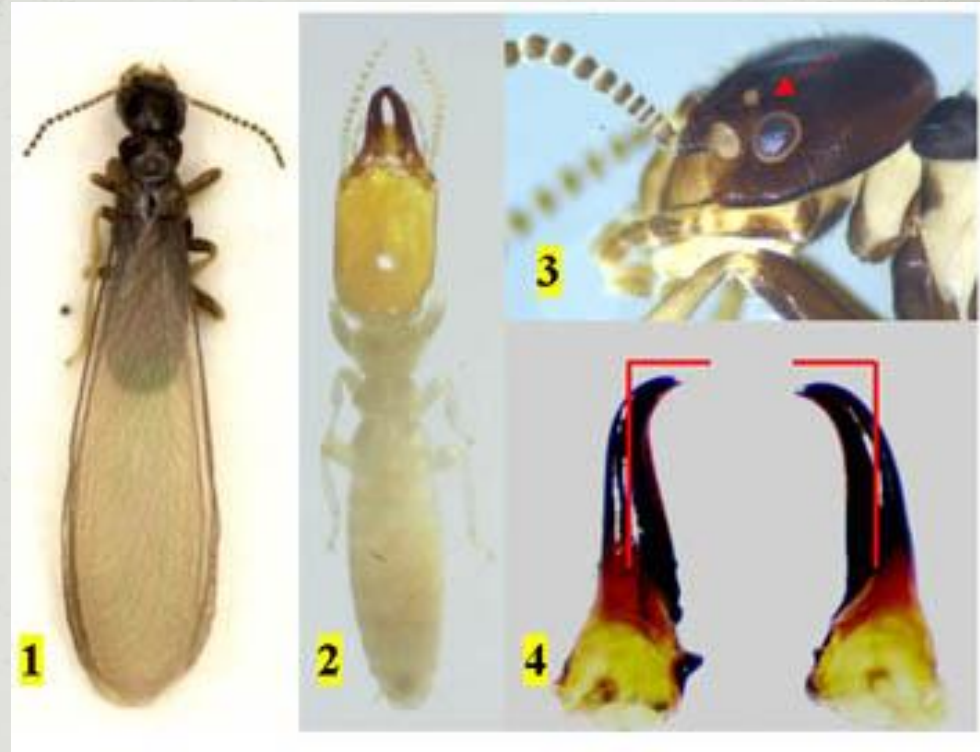
Drywood termite  
mandibles with  
teeth



Subterranean termite  
soldier mandibles smooth  
in appearance, “teeth” less  
pronounced

# Most Commonly Encountered Subterranean Termites

- *Reticulitermes* \_\_\_\_\_
  - \_\_\_\_\_ subterranean termite



Large mandibles with left and right mandible distinctly curving inward close to 90°



# Less Commonly Encountered Subterranean Termites

- *Coptotermes* \_\_\_\_\_
  - \_\_\_\_\_ subterranean termite

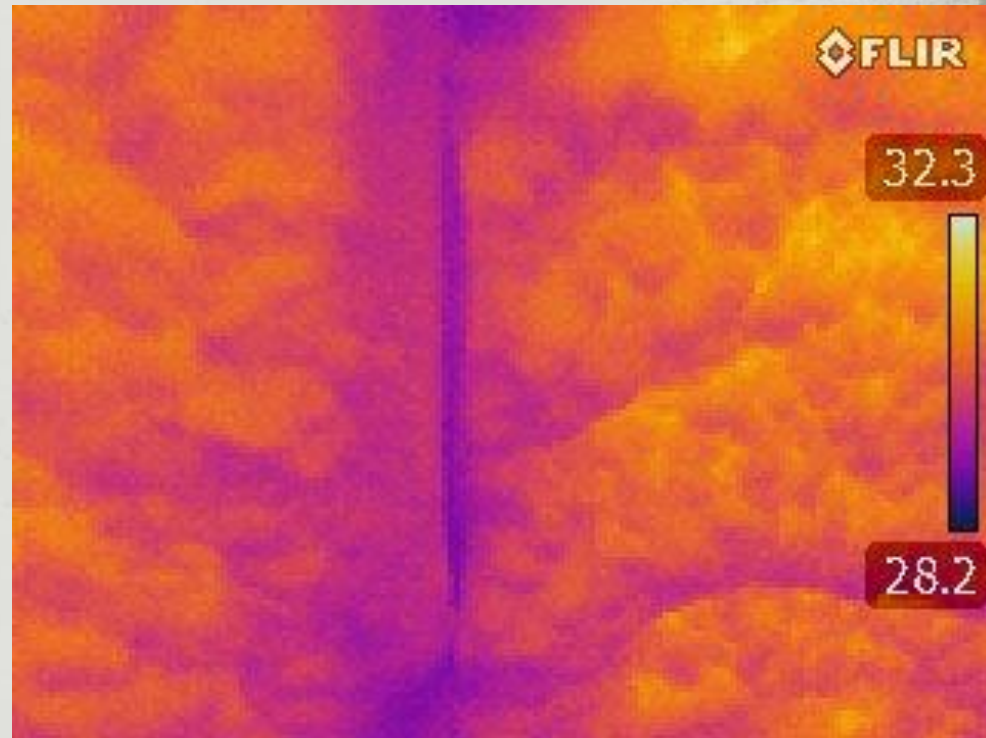


**Figure 2.** Known distribution of the Formosan subterranean termite, *Coptotermes formosanus* Shiraki, in the United States, as of 2004. Graphic by Nan-Yao Su, UF

[http://www2.lsuagcenter.com/domains/lafirst/lahouse/termites/la\\_guide\\_d\\_south\\_sub.asp](http://www2.lsuagcenter.com/domains/lafirst/lahouse/termites/la_guide_d_south_sub.asp)

# Inspection is the Key to Termite Management

- How would you conduct an inspection?
- Be systematic
- Tools of the trade
- What recommendations would you make?





# The Drones of Pest Control



2016/03/04 22:07:03



# Inspection Tip

## ● Get a good flashlight!

Amazon.com: LED flashlight

www.amazon.com/s/ref=nb\_sb\_noss?url=search-alias%3Daps&field-keywords=LED+flashlight&rh=i%3Aaps%2Ck%3ALED+flashlight

Apps Sign In Google Public Notices / Welcome Search New Tab Pest Managem... Pest Managem... Termite Help / ... (180 unread) ... Food Hygiene | ... Chrome Browser Free Aver

**Flashlight Filter:**

- BlueFire
- Dorcy
- J5 Tactical
- BYB
- SAFE BRIGHT
- refun
- Durapower
- ouille
- Flashlights
- OXYLED
- MagLita
- AYL
- See more

**Packaging Option**

- Frustration-Free Packaging (12)

**Avg. Customer Review**

- ★★★★★ & up (6,002)
- ★★★★☆ & up (7,850)
- ★★★☆☆ & up (8,383)
- ★★☆☆☆ & up (11,067)

**New Arrivals**

- Last 30 days (3,368)
- Last 90 days (7,743)
- Coming Soon (12)

**International Shipping**

- Amazon Global Eligible

**Condition**

- New (55,810)
- Refurbished (51)
- Used (808)

**Price**

- Under \$25 (26,335)
- \$25 to \$50 (13,977)
- \$50 to \$100 (10,420)
- \$100 to \$200 (3,847)
- \$200 & Above (1,521)

**Discount**

- 10% Off or More (18,065)
- 25% Off or More (15,962)
- 50% Off or More (8,074)
- 70% Off or More (1,505)

**Seller**

- YanLiao (3,031)

**Flashlight Listings:**

- Xtreme Bright Magnetic Telescopic Pocketlight, LED Mini Flashlight with 22 inch Flexible Telescoping Head - Very** by Xtreme Bright  
\$24.99 ~~\$24.99~~ Prime  
Some colors are Prime eligible  
★★★★★ 156
- Xtreme Bright Utility Light - Multitool With More than 10 Tools and LED Flashlight - Perfect Fishing, Camping & Hunting** by Xtreme Bright  
\$8.97 - \$23.27 Prime  
Some colors are Prime eligible  
More Buying Choices  
\$8.97 new (3 offers)  
\$7.62 used (1 offer)  
★★★★☆ 111
- Refun 600 Lumen Handheld Flashlight Led Cree Xnl- T8 Water Resistant Camping Torch Adjustable Focus Zoom Tactical...** by Refun  
\$13.99 ~~\$30.00~~ Prime  
Get it by **Tuesday, Jan 19**  
More Buying Choices  
\$13.01 used (1 offer)  
10% off item with purchase of 1 items See Details  
★★★★★ 700
- Dorcy Waterproof LED Flashlight 41 2510, 55 Lumens, Yellow** by Dorcy  
\$6.98 ~~\$40.00~~ Add-on Item  
Add to a qualifying order to get it by **Tuesday, Jan 19**.  
More Buying Choices  
\$7.35 new (105 offers)  
\$6.95 used (3 offers)  
★★★★★ 2,319
- UltraFire E17 Cree XM-L T6 2000 Lumen Zoomable and Waterproof LED Flashlight** by Ultrafire  
\$9.33 - \$19.99 Prime  
Some options are Prime eligible  
More Buying Choices  
\$8.30 new (16 offers)  
★★★★☆ 182
- SOLARAY PRO ZX 1 Professional Series Flashlight Kit - Our Best and Brightest LED Tactical Flashlight (rechargeable...** by Solaray  
\$58.95 ~~\$79.95~~ Prime  
Get it by **Tuesday, Jan 19**  
More Buying Choices  
\$59.94 new (2 offers)  
★★★★★ 1,387
- Pack of 4, BYBlight Super Bright 9 LED Mini Aluminum Flashlight with Lanyard, 4 Assorted Colors: Black, Blue,...** by BYB  
\$8.89 ~~\$29.99~~ Prime  
Get it by **Tuesday, Jan 19**  
★★★★★ 221
- J5 Tactical V1-Pro Flashlight - The Original 300 Lumen Ultra Bright, LED Mini 3 Mode Flashlight** by J5 Tactical  
\$12.95 ~~\$29.95~~ Prime  
Get it by **Tuesday, Jan 19**  
More Buying Choices
- OXYLED MD50 Cree 500 Lumen Bright LED Flashlight Bundle with Rechargeable Batteries, AC Charger + Charger Base.** by OXYLED  
\$19.99 ~~\$29.99~~ Prime (4-5 days)  
Get it by **Tuesday, Jan 19**  
More Buying Choices

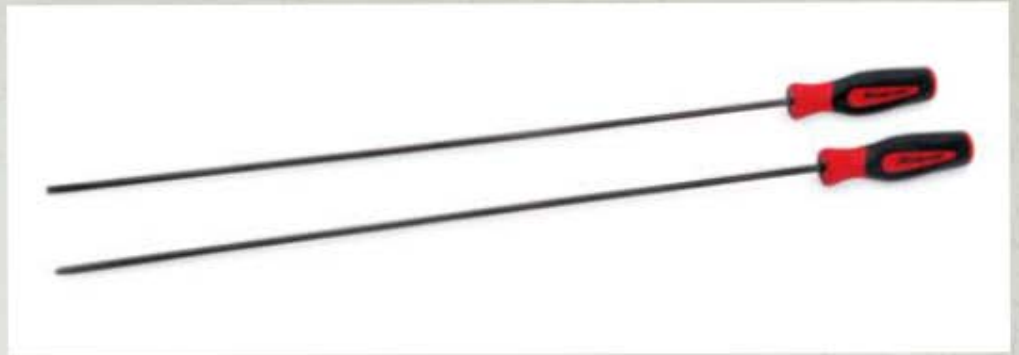


# Inspection Tip

## Learn how to use it...



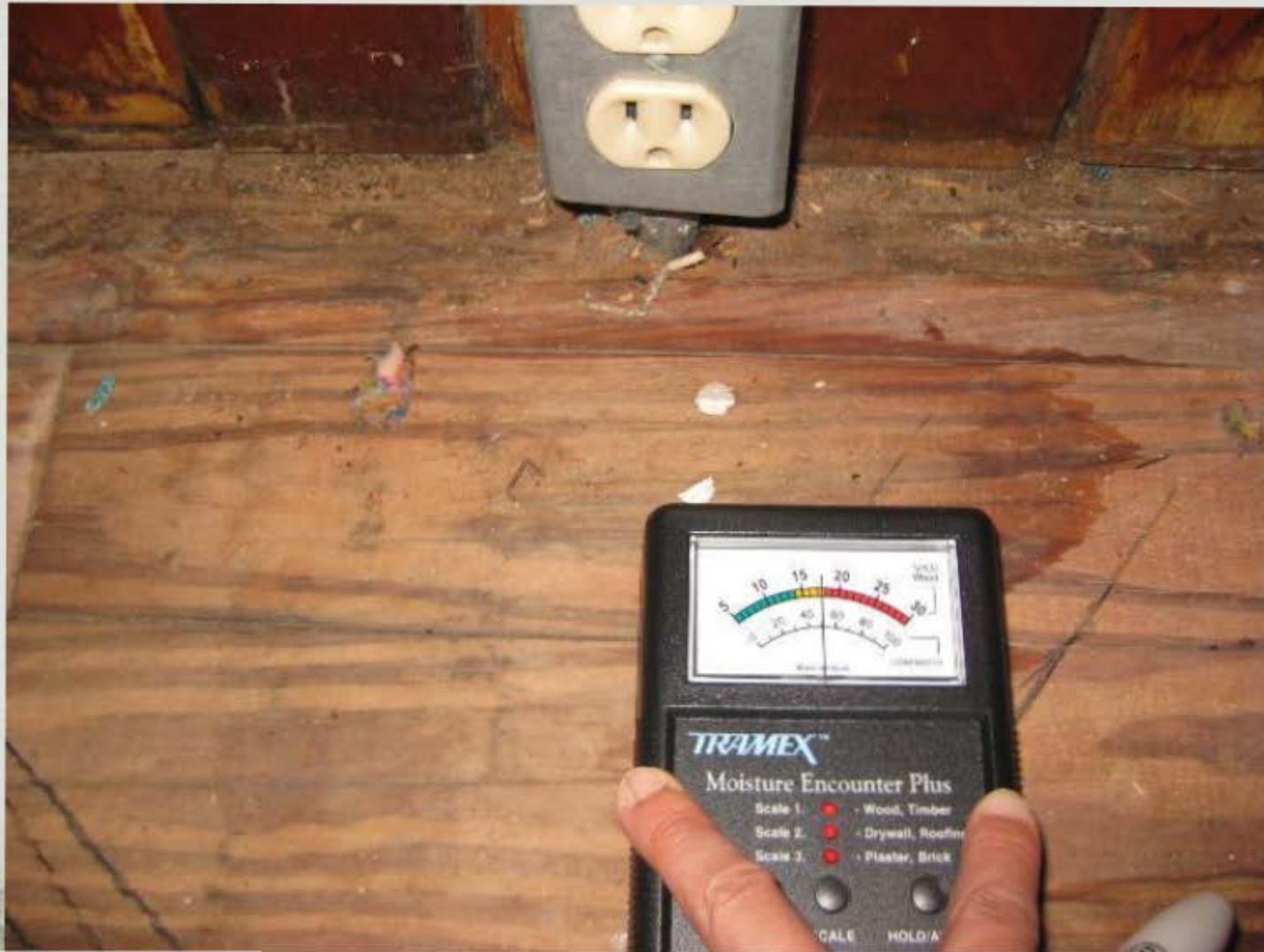
# Probe





# Inspection Tip

## Moisture Meter



# Inspection Tip

## Moisture Meter













# Use a Measuring Wheel!









# Conductive Conditions Prevention and Sanitation



# Termite Prevention Recommendations Haven't Really Changed in 80 Years

## BAD:

- Wood in contact with ground
- Plant roots leading to foundation
- Watering walls
- No inspection space
- Moisture

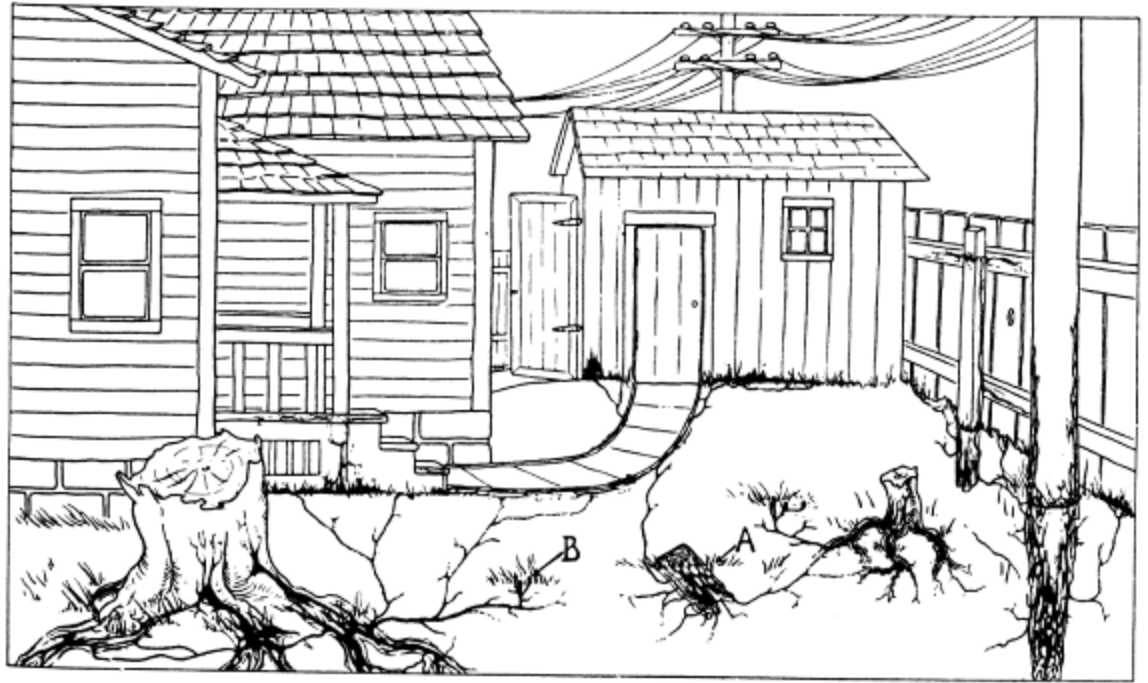


Fig. 50. This sketch combines the sorts of conditions found to prevail in many localities where wood has been improperly used. Unprotected wood in or on the ground makes possible both settlement and rapid increase of the subterranean termites. Workings in stumps, poles, posts, sidewalks, and wood of buildings are shown in black, as are the galleries within the earth. *A* marks the supposed original point of entry of one of the colonizing pairs, and *B* the points of emergence of swarming alates at the proper season.



Who does this?





# Conductive Conditions Can Start Before Construction





# Conductive Conditions Can Start Before Construction



Not every  
site will  
look this  
clean



# Conductive Conditions Can Start Before Construction





# Form Boards and Grade Stakes



# Insulation Below Grade





# Foam Block Below Grade





# Landscaping







# Inspection is the Key to Termite Management

- Think about your schools, what recommendations would you make?
- Do you have a quality control process?



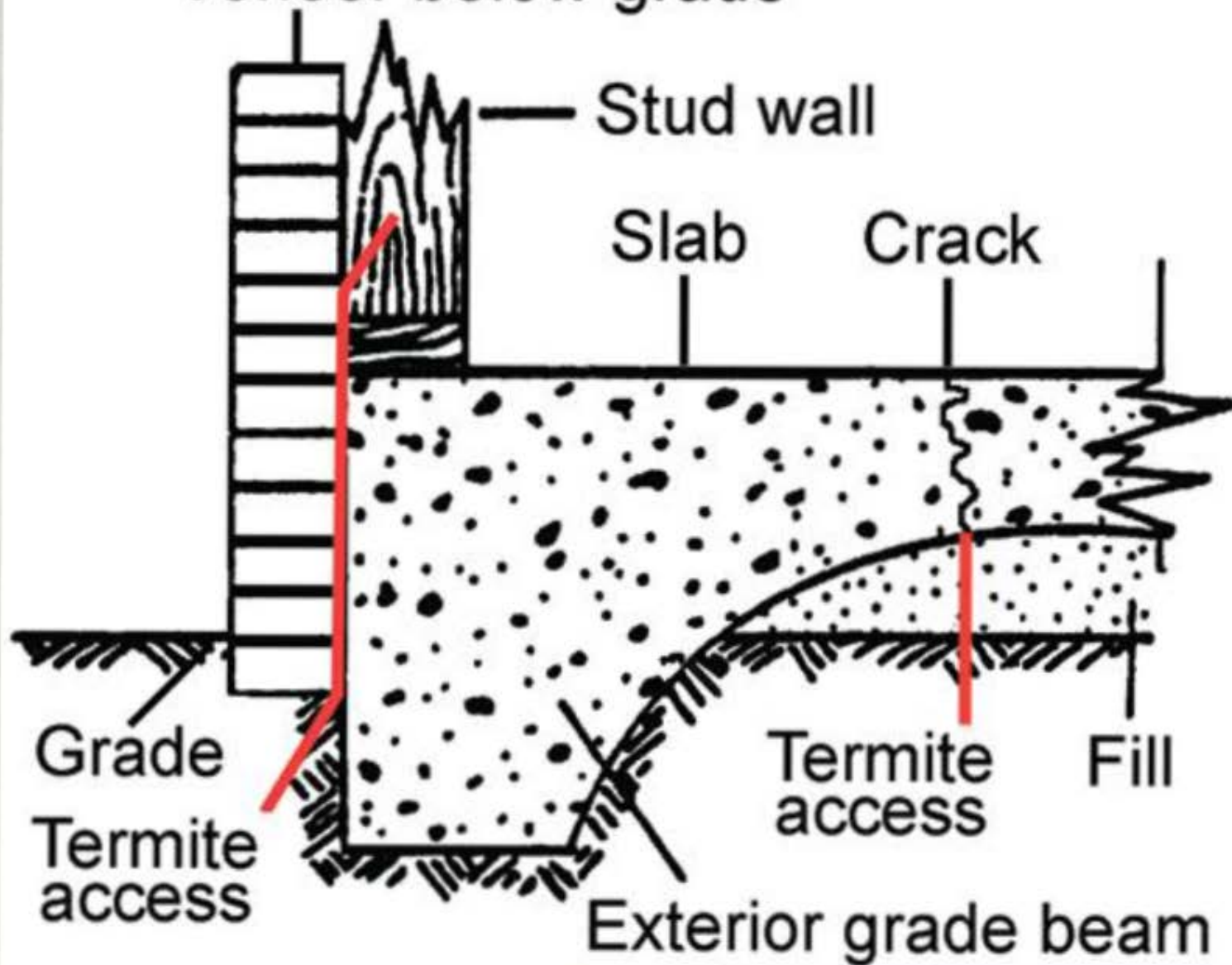
# What to observe with vendors

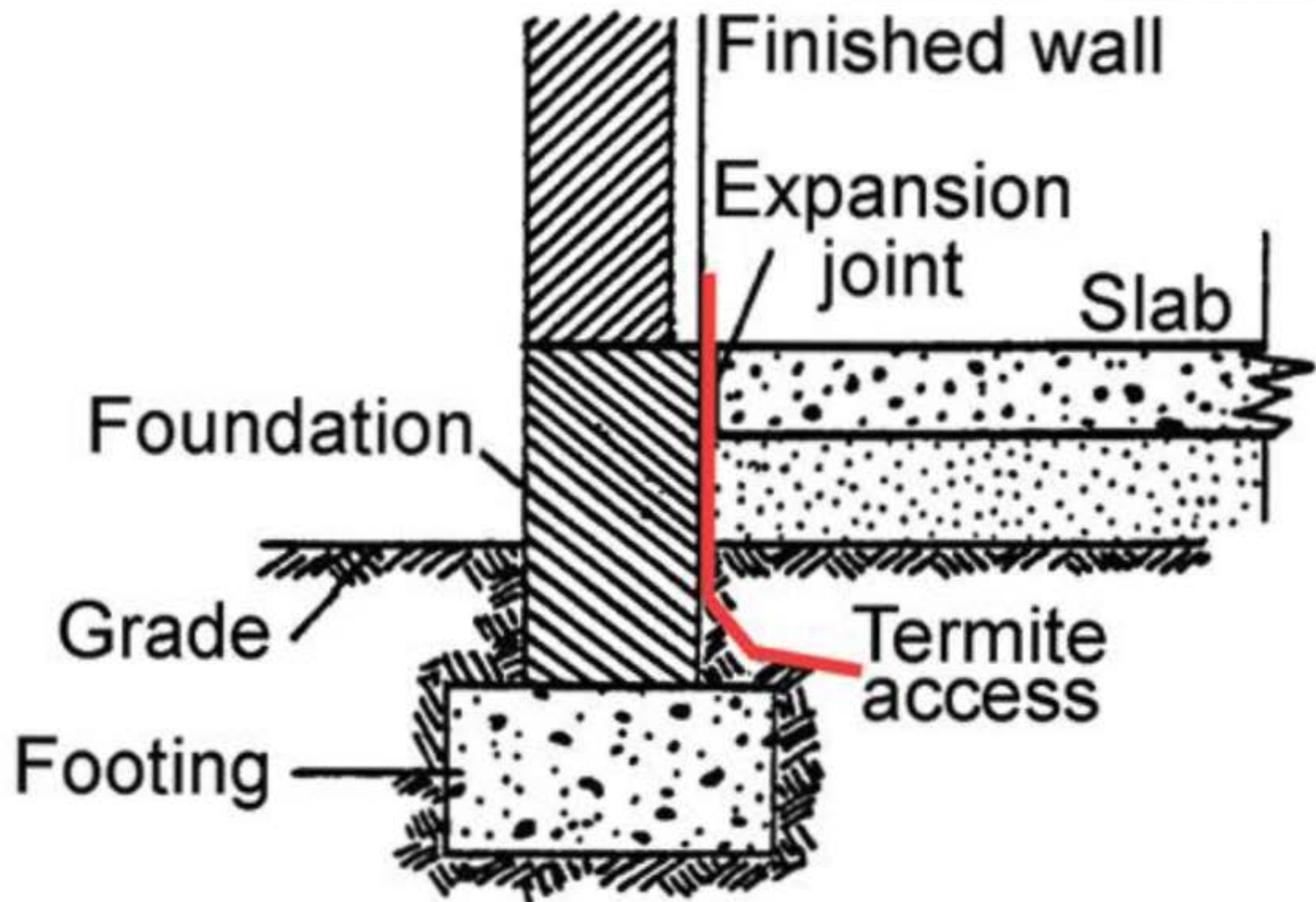
- Did they do an inspection to identify where and how termites are entering?
- Can they tell you what slab type you have and how termites might be entering? Goes to treatment recommendations.
- Easy check: match gallons purchased and gallons used with work required.
  - Require mixing onsite



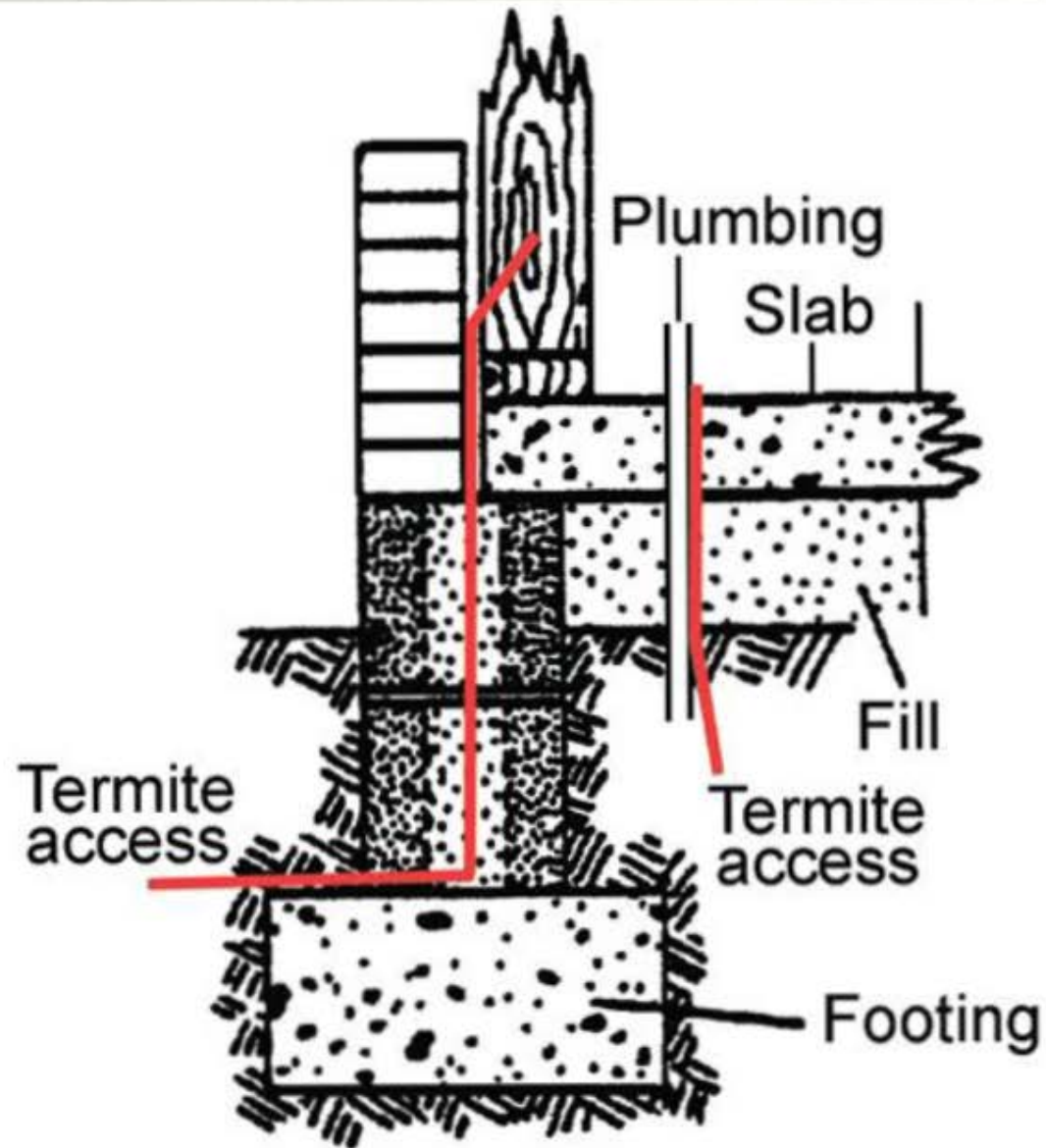


Veneer below grade









# Pipes and Conduits (Electrical Service)





# What to expect when working with a pest control company

- Or maybe, what to ask when working with a pest control company
  - Are they licensed to do termite work?
  - Have they done termite treatments on commercial buildings?
  - Will they warrantee their work? If not, why?

# Successful termite jobs

- Know which termite (sub or DW)
- Know your construction type
  - Start with slabs; get plans
- Know the label
  - Product—rates
  - 1/10, 2/10, 4/10...what does this mean?
- Rig—calibrated?
  - Product distributed?
  - Application—tips that can help you
- Enough product to mix on site? How do you know this?
- Calculations!



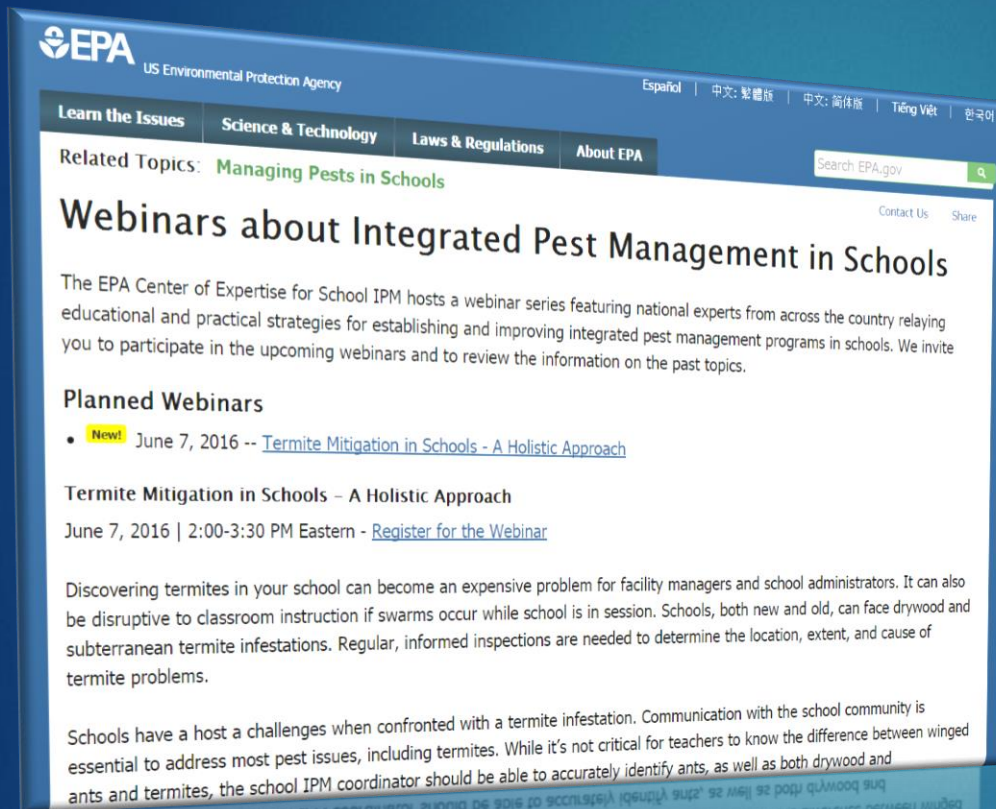
# Termite Mitigation in Schools

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# Future Webinars



The screenshot shows the EPA website with the following elements:

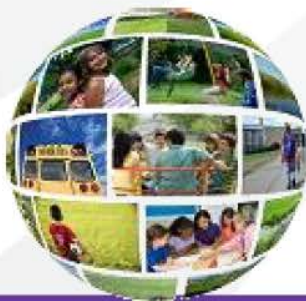
- EPA Logo:** US Environmental Protection Agency
- Language Links:** Español, 中文: 繁體版, 中文: 簡體版, Tiếng Việt, 한국어
- Navigation Menu:** Learn the Issues, Science & Technology, Laws & Regulations, About EPA
- Search Bar:** Search EPA.gov
- Related Topics:** Managing Pests in Schools
- Contact Us / Share** links
- Section Header:** Webinars about Integrated Pest Management in Schools
- Text:** The EPA Center of Expertise for School IPM hosts a webinar series featuring national experts from across the country relaying educational and practical strategies for establishing and improving integrated pest management programs in schools. We invite you to participate in the upcoming webinars and to review the information on the past topics.
- Section Header:** Planned Webinars
- Webinar List:**
  - New!** June 7, 2016 -- [Termite Mitigation in Schools - A Holistic Approach](#)
- Webinar Details:**
  - Termite Mitigation in Schools – A Holistic Approach**
  - June 7, 2016 | 2:00-3:30 PM Eastern - [Register for the Webinar](#)
- Description:** Discovering termites in your school can become an expensive problem for facility managers and school administrators. It can also be disruptive to classroom instruction if swarms occur while school is in session. Schools, both new and old, can face drywood and subterranean termite infestations. Regular, informed inspections are needed to determine the location, extent, and cause of termite problems.
- Additional Text:** Schools have a host a challenges when confronted with a termite infestation. Communication with the school community is essential to address most pest issues, including termites. While it's not critical for teachers to know the difference between winged ants and termites, the school IPM coordinator should be able to accurately identify ants, as well as both drywood and



# CERTIFICATE *Of* PARTICIPATION

This is to certify the above participant attended the 90-minute webinar entitled

## TERMITE MITIGATION IN SCHOOLS – A HOLISTIC APPROACH



PRESENTED BY:

EPA's Center of Expertise for School IPM

ON THIS DAY:

June 7, 2016

# *Sign up for* EPA's School IPM Listserv





# Questions?



*Image: Clemson University / USDA Cooperative*

**Center of Expertise for School IPM**